

### **Remarks**

No amendments are made to the claims since Applicants firmly believe that the invention as presently claimed is patentable over the prior art references raised by the Examiner.

The Examiner has maintained his rejection of claims 1, 6 and 27 under 35 USC 102(b) as being anticipated by Taga et al (US 5,585,954) and his rejection of claims 8, 16-19 and 28 under 35 USC 103(a) as being unpatentable over Taga in view of Scholz et al (US 5,325,397).

Applicants have explained in their previous response of March 17, 2006 why Taga does not teach measuring noise or amplitude distortion. Applicants maintain their previous response as entirely pertinent.

The Examiner has continued to disallow the application in the April 13, 2006 Advisory Action, arguing that: "Taga disclosed that signal detector output is composed to the pseudo-random generator the [sic] check for differences. This provides the data that can be used for determining noise regardless if the term is used or not."

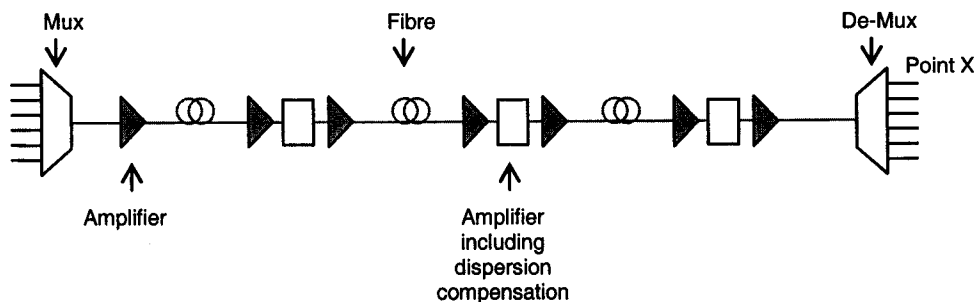
The cited passage merely teaches how signal decision circuit 5 determines whether or not a bit error has occurred. Bit error rate (BER) is used directly to calculate a Q value. There is simply no teaching in Taga of determining an amplitude distortion component of an optical transmission signal as required by the claims.

The Examiner states that certain data can be used for determining noise. This is not sufficient to substantiate a claim rejection under 35 USC 102. The Examiner, as a matter of law, is required to show how each and every element of the claim is taught by the prior art reference (MPEP 2131). Applicants deny that one skilled in the art

would find any teaching in the passage cited by the Examiner that would enable him to measure noise or amplitude distortion. The Examiner's assertion is simply unsubstantiated.

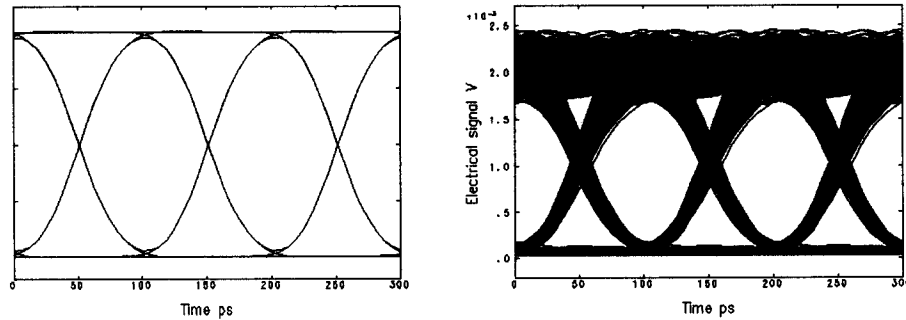
Perhaps the following explanation of the present invention will assist the Examiner in understanding the differences over conventional Q measurement approaches such as taught by Taga.

The operation of the invention may be best explained by way of an example. Figure 1 shows an optical transmission system consisting of an optical multiplexer, a booster amplifier, three spans of transmission fibre of length 80 km, three amplifiers which incorporate dispersion compensation and an optical de-multiplexer. When the system is operating normally the signal that emerges from the de-multiplexer at point X has a Q factor of about 14 which means that no errors are seen.



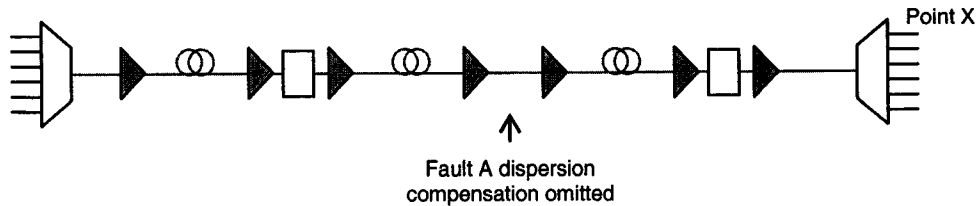
**Figure 1 – Example transmission system**

Figure 2 shows the signal that emerges from one of the ports of the de-multiplexer (point X) under these conditions. On the left is the “eye diagram” of the optical signal with no noise present (of course it would not be possible to see this in a real system) and on the right is the “eye diagram” that would be measured. This is the signal on the left together with the noise due to the optical amplifiers.



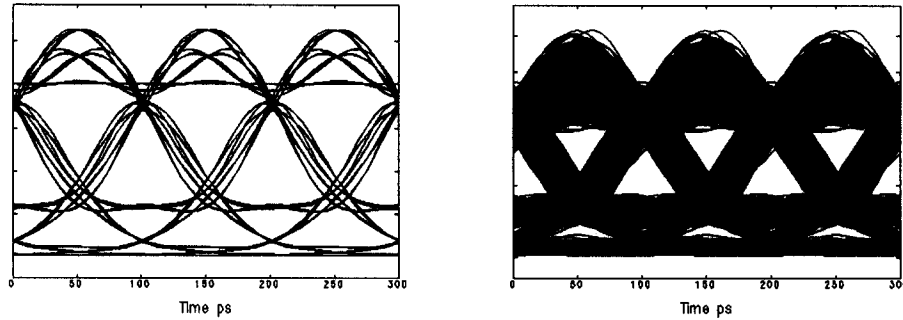
**Figure 2 – Eye diagrams at point X**

Now, consider two possible faults in this system. Fault A is the omission of the dispersion compensation module from the second line amplifier as shown in Figure 3.



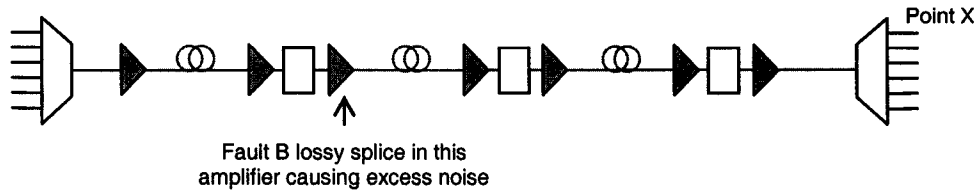
**Figure 3 – Fault A**

This fault causes considerable distortion of the signal seen at point X. This is illustrated in Figure 4. As before, on the left is the “eye diagram” of the optical signal with no noise present and on the right is the “eye diagram” of the distorted signal together with the noise due to the optical amplifiers. The noise level is substantially the same as it was without the fault, but because the “eye” is partially closed, the ratio of the eye opening to the noise is reduced and the Q factor has reduced to 6.6 which is equivalent to a Bit Error Ratio (BER) of about  $2 \times 10^{-11}$



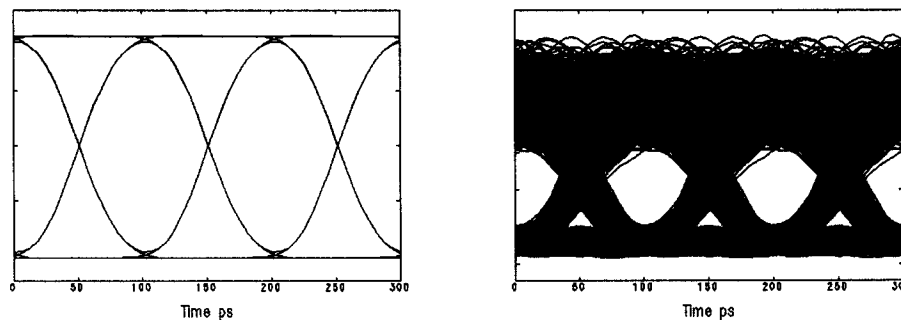
**Figure 4 – Eye diagrams at point X due to fault A**

Fault B is illustrated in Figure 5. Here, a splice within one of the optical amplifiers has a very high loss leading to much more noise than expected to be added to the optical signal.



**Figure 5 – Fault B**

This fault does not distort the optical signal as can be seen on the left of Figure 6. The eye diagram on the right, however, is closed by increased noise causing the Q factor to be reduced to 6.6 which is equivalent to a Bit Error Ratio (BER) of about  $2 \times 10^{-11}$  which is the same as for fault A.



**Figure 6 – Eye diagrams at point X due to fault B**

Conventional Q measurement such as that disclosed by Taga simply sweeps the decision threshold of an error detector through the center portion of the eye and reports the Q factor. For both faults A and B this is 6.6. In other words the methods disclosed by Taga cannot tell the difference between the two faults.

In the present invention, in contrast to this, by determining at least the amplitude distortion component, an evaluation of the noise level that is not relative to the eye is possible. This is not taught or possible using the methods disclosed in Taga.

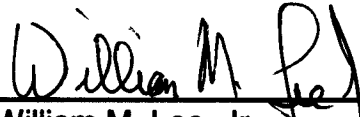
Since Taga fails to teach the feature of determining an amplitude distortion component of an optical transmission signal, Applicants firmly believe that claims 1, 6 and 27 are allowable.

Dependent claims 2 to 8 and 16 to 19 and 28 depend on claim 1 and so are allowable for the same reasons. Independent claim 9 has corresponding distinctive features to those of claim 1 and so is allowable for the same reasons. Dependent claims 10 to 14 depend on claim 9 and so are allowable for the same reasons. Claim 15 has already been allowed. Independent claim 20 has distinctive features corresponding to those of claim 1 and so is allowable for the same reasons. Dependent claims 21 to 25 and 27 depend on claim 20 and so are allowable for the same reasons. Independent claim 26 has been allowed.

All the points raised have been dealt with, all the claims are submitted to be allowable as cast, and reconsideration is requested.

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Respectfully submitted,

  
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